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The impact of deer on the rhinoceros auklet (Cerorhinca monocerata) colony on Protection Island, WA

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Background

• The effects of mammalian herbivores on seabird colonies have been documented (erosion of habitat, loss of vegetation, damage to nests) (Platenberg et. al 2005, Gillham 1963).

•Gladics et. al (2009) found a significantly greater percentage of damaged pink-footed shearwater (*Puffinus creatopus*) breeding burrows at sites with cattle grazing than sites without grazing.

•Protection Island National Wildlife Refuge is a critical site for North American seabirds. It is home to one of the largest nesting colonies of rhinoceros auklets (*Cerorhinca monocerata*) in the world. Rhinoceros auklets nest in burrows which they excavate on the slopes of the island.

• In the early 1990s, black-tailed deer (*Odocoileus columbianus*) spread to Protection Island.

•Deer have been observed to walk through the auklet breeding colony. No quantitative assessments of deer impacts to the colony have been conducted although anecdotal observations have documented damaged burrows.

Objective

•The purpose of this study was to quantitatively assess the impact deer have on the rhinoceros auklet colony to determine if impacts observed have significant population-level effects.

Questions

1. What is the incidence of burrow damage in the auklet colony and how severe is the damage?
2. Is burrow damage related to the number of deer trails?
3. How do deer use the colony?
4. Does deer presence in the colony change throughout the day?
5. Does deer use of the colony change throughout the season?

Methods

Assessment of burrow damage

• 5 x 5 m plots (n= 40) were established randomly throughout the rhinoceros auklet breeding colony.

•For each plot, I measured and recorded the following: the number of burrows, the number of damaged burrows, the severity of damage of each burrow (see below), the area of deer trail cover, the number of trails, and the percent cover of vegetation type (grass and forb) and bare ground. Slope and aspect were also measured.

•Damaged was categorized based on the location of damage relative to the general burrow structure. The categories were as follows: entrance damage, punch through to the tunnel, tunnel collapse, and nest chamber collapse.

•Deer trail area was measured by measuring the width and length of each trail.

Behavioral observations

•Deer were observed on the colony throughout the months of June and July. Observations were conducted from 4:30-6:30 and 7-9 h in the morning and 17:30 -19:30 and 20-22 h in the evening.

•Deer were observed in four locations within the auklet colony: northeast slope, southeast slope, west slope and upper slope.

•At least two observations were conducted for each time period at each location for both the months of June and July.

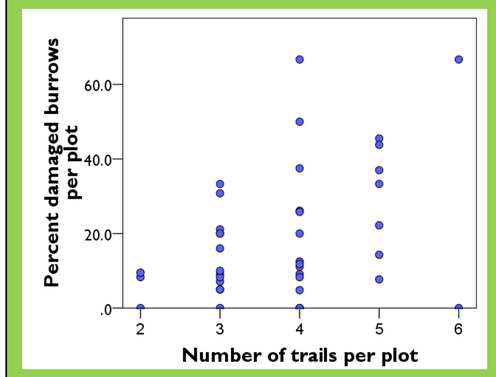
•In each observation period, I recorded the number of bucks, does, and fawns and the behavior of each individual at 2 minute scans. Behaviors recorded included feeding, standing, walking, running, and laying down.

Results

Assessment of Burrow Damage

•I observed burrow damage in 85% of the plots. On average, 12.1% of burrows per plot showed evidence of damage. On average, 6.7% of burrows per plot showed evidence of structural damage (damage to the tunnel and nest chamber) and 6.9% of burrows per plot showed evidence of entrance damage.

•On average, deer trails covered 37% of each plot. The average number of trails per plot was 4.



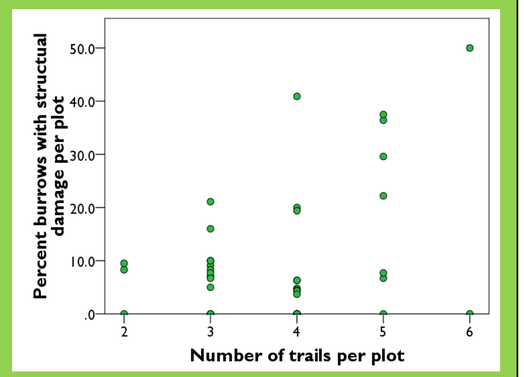


Fig. 1. The relationship between the number of trails and burrow damage**.** The percent burrows that showed overall damage and structural damage was significantly correlated to the number of deer trails per plot once other environmental factors were taken into account (slope, percent of bare ground, and percent of grass cover) ($p<0.01$).

• Structural damage was significantly correlated to the percent of bare ground, once other factors were taken into account (number of trails, percent of grass cover, and slope) ($p<0.05$).

Behavioral Observations

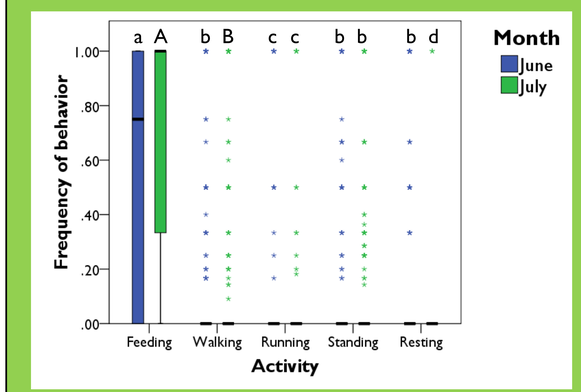


Fig. 2. Change in deer behavior across the month of June and July in the colony. Feeding was the predominant behavior observed ($p<0.0001$). In June, running was the least observed behavior ($p<0.0001$), however, in July, resting became the least observed behavior ($p<0.01$). The frequency of feeding ($p<0.0001$) and walking ($p<0.05$) was greater in the month of July than June The frequency of resting decreased significantly between the months of June and July ($p<0.0001$). Bars represent interquartile ranges and bold lines represent medians. Stars represent extremes.

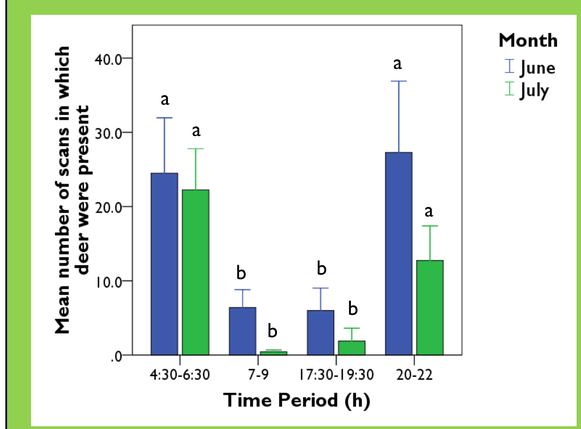


Fig. 3. Change in deer presence across time of day and between the months of June and July in the colony. There were significantly more scans in which deer were present in the 4:30-6:30 and 20-22 h time periods than in the 7-9 and 17:30-19:30 h time periods ($p<0.05$). There were more scans in which deer were present in the month of June than in July although this was not significant ($p>0.05$). Error bars represent standard error.

•The number of deer per scan was significantly greater during the 4:30-6:30 h time period (range 1-11) than in other observation periods (range 1-4 in other time periods) ($p<0.0001$).

•The median time a deer spent in the observation area was 8 minutes and ranged from 1 to 73 minutes.

Discussion/ Conclusions

•The deer appear to have a significant impact on the burrows which may negatively impact the reproductive success of the colony.

•The auklet colony is used extensively by deer, predominantly for feeding, as evidenced by the established trails and behavioral observations.

• Deer appear to be most active in the colony in the early morning and late evening.

•The presence of deer in the colony may decrease later in the summer. This may be due to the fact that vegetation dries out later in the summer.

Future analyses

•Determine if deer presence/ number and behavior differs between the different observation areas.

•Determine if male or female deer presence/ number and behavior differs in the colony.

•Determine if there is an interaction between month, observation area, and time of day on deer presence, number, and behavior.

•Determine if deer presence/ number is related to burrow damage.

Acknowledgements

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